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Maine Agricultural Experiment Station

ORONO

BULLETIN No. 207. DECEMBER, 1912.

INSECT NOTES FOR 1912

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This bulletin contains notes of some of the more important insects of the year 1912, among them common scale insects, fruit and shade tree pests, wire worms in corn, and parasitic four winged flies.

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BULLETIN No. 207.

INSECT NOTES FOR 1912.*

O. A. JOHANNSEN.

These notes are abstracts from our Station records for the present year. Though most of them deal with well known insects they are here presented because of their significance with reference to our local conditions. It is hoped that they may also contain sufficient new data upon habits and distribution to be of interest to other entomologists. In some cases descriptions, figures, and remedial measures are given so that these notes may be of service to the general reader.

The season just past has been in some ways of unusual entomological interest. The ravages of the spruce bud moth, the abundance of a spruce leaf miner and the occurrence of other spruce insects has turned much of the attention toward the conifers both native and those introduced for ornamental purposes. The increase of the gypsy moth area and the continued spread of the browntail moth have given the emphasis of one more year's experience with these two pests of paramount importance. The season has been so favorable to the development of scale insects that even those species ordinarily little noticed have been conspicuous in many parts of the State. Fortunately correlated with the abundance of injurious species the insects of 1912 have included beneficial species in great numbers. The syrphus maggots and other predaceous insects, for instance, have practically exterminated many species of plantlice over large areas, and parasites have been actively engaged in their natural welfare against the injurious caterpillars and other insects.

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* Papers from the Maine Agricultural Experiment Station: Entomology No. 61.

HOMOPTERA.

SCALE INSECTS, PLANT LICE AND OTHER BUGS.

Among the many insects which trouble the agriculturist, there is perhaps no one group which is more injurious than are the Coccidae or scale insects. In Maine there are a number of species but owing to their small size, and sombre coloring they are often passed unnoticed. The increasing practice of spraying of orchard trees by our fruit growers will tend to check the spread of species already established and prevent new ones gaining a foot hold. As the insect has sucking mouth parts and lives upon the juices of the host plants, they must be fought by means of contact sprays, such as oil emulsions, whale oil soap, or lime-sulphur. The last mentioned remedy used late in the winter as a dormant spray,* is especially recommended, for most of the species of scales mentioned in the following account.

In the preparation of these insects for examination to determine the species it is often necessary to remove them from the plant, treat them for a brief period in caustic potash, and after rinsing them in water, transfer them through several grades of alcohol, clearing in turpentine, or xylol, or other clearing fluid, and finally mounting on a glass slide in Canada balsam. Many of the scale insects are protected by a scale from which they must be removed before mounting them for examination. The scales which cover the insects in some species resemble each other so closely that the most experienced student of scale insects will not identify them without first making balsam mounts. It is therefore essential in the case of some of these species, as for example the San Jose scale, that judgment be suspended as to its identity until a thorough examination can be made.

Aspidiotus ostreaeformis.

EUROPEAN FRUIT SCALE.

Curtis, Gardiner's Chronicle III, p. 895, 1843.
Newstead, Monogr. British Coccidae. I, p. 99.
Marlatt, U. S. Dept. Agr., Div. Ent., Bul. 20, p. 81.

* See "Apple Tree Insects of Maine," or "Apple Tree Disease," for method of preparing these sprays. These bulletins may be obtained free of charge by residents of the State upon application to the Director, Maine Agricultural Experiment Station, Orono, Maine. Both have been republished in the Report Agricultural Commissioner for 1910 under the title "Apple Tree Enemies of Maine."

Scale of female. It is circular or broadly oval in outline, dark ashy gray in color with paler margin; sometimes the scale is nearly white. The exuvia is central or nearly so, dark brown, usually naked and glossy. Diameter 1-8 of an inch.

"Adult female short ovate, almost circular, old specimens becoming chitinized; yellow or ochreous yellow. Parasitised examples broadly pyriform, inflated, usually bright orange brown, and highly chitinized. Rudimentary antennæ a mere stump with a long stiff spine at the base. Rostral filaments scarcely longer than mentum. Free abdominal segments, and margin in front with a few long hairs. Pygidium always with five groups of circumgenital glands, the anterior group consisting of from 5 to 8, the anterior laterals from 7 to 12, the posterior laterals from 5 to 16. The formula of twelve examples from a single colony on plum are given below:

5	7	5	6	5	6
8—10	9—10	8—7	7—8	9—9	6—7
8—10	9—8	5—6	10—11	11—9	12—11
6	5	5	8	6	5
11—7	9—10	7—11	8—8	12—12	9—9
8—8	8—11	16—13	12—11	11—14	11—9

"The subdorsal groups of tubular spinnerets, rather short, are connected with a double series of glands or pores. Extending from near the last marginal spine to the base of the pygidium on the dorsum is a series of, usually four, large circular pores. Vaginal opening central. Anal opening about midway between the former and the apex of the pygidium. Margin of pygidium with two pairs of lobes; median pair well developed, rounded, and notched at the sides; second pair broader than the former, but only about half the length, with the hind margin emarginate, or irregularly notched, forming a wavy outline; third pair obsolete. The first pair of plates are simple and spinelike; the second finely serrate; the first two beyond the second lobe simple or bifurcate; the third, usually, deeply and widely serrate. There are usually five long spines on either side—the first at the base of the anterior margin of the median lobes; the second and third, opposite, are attached to the base of the second lobe; the fourth and fifth considerably beyond, equidistant from the second, and somewhat longer. The body-wall is considerably thickened and chitinized at the base of the plates.

"The second-stage female possesses no ventral circumgenital glands; these organs are not developed until after the final moult.

"Perfect male varying from ochreous to pale orange yellow. Apodema black, shining. Legs dusky with long sparse hairs. Eyes and ocelli black. Abdomen gradually becoming paler towards the extremity. Antennæ of the same colour as the legs, having eight long clubbed hairs on the apical joint." *

* Newstead, Mongr. British Coccidae I, pp. 100-102.

Life history. The winter is passed by partly grown individuals which become mature early in the summer. The insect gives birth to living young which begin to appear soon after the maturity of the female. In this State they are apparently but one brooded.

This scale has been recorded from a number of different plants, among them, the apple, pear, plum, peach, cherry, birch, poplar, horse chestnut, basswood, alder, haw, maple, aspen, oak,

FIG. 475.

etc. It has been reported in this country from Maine, New York, New Jersey, Michigan, Ohio, Iowa, Idaho, California and several other states. In Maine it is most frequently found on large trees in old and neglected orchards, though we have records also of its occurrence on currant bushes. Specimens the past season were received from Brunswick, Millvale, Buckfield and W. Auburn.

Remedies. Spraying with lime-sulphur late in the winter or early spring before the appearance of the leaves will control it.

Aspidiotus perniciosus.

SAN JOSÉ SCALE.

Comstock, U. S. Dept. Agr., Div. Ent. 1880, p. 304.
Herrick. Technical Bul. 2, Miss. Agr. Exp. Sta., 1911.

Scale of female. It is circular in outline, flat, with exuviae in the center surrounded by conspicuous concentric rings. Scale gray, except central part which varies from pale yellow to reddish yellow, or sometimes even black. Diameter about 1-16 of an inch.

"Female. The body is nearly circular in outline and yellowish in color. There are two pairs of lobes with the median well developed. These appear to converge, are notched once on the lateral edges, rounded at the apices, and the thickened mesal margins extend cephalad and encircle the anal opening in a conspicuous manner. The second lobes are smaller, converge toward the median, and are notched on the lateral

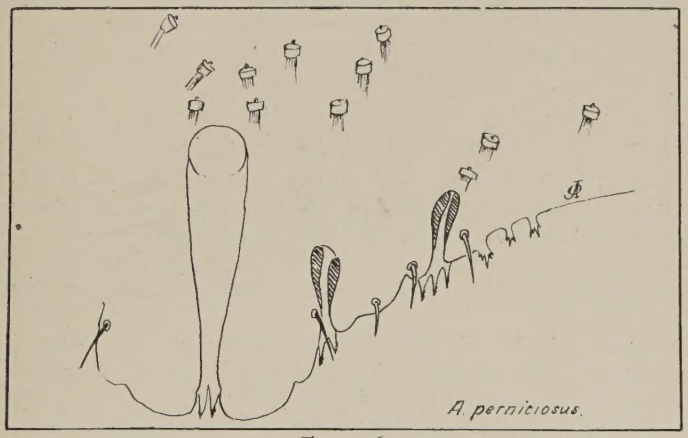

FIG. 476.

margins. There are two thickened processes between the median lobes and two surrounding each incision, the inner the larger. There are two pectinæ between the median lobes, very inconspicuous, two pectinæ in the first incision, three pectinæ in the second incision, and three or more wide, fringed extensions of the pygidial margin laterad of the second incision. These extensions are very characteristic, in fact, are a *diagnostic character.* There is a spine on the lateral base of each lobe, one laterad of the second incision and one, one-half the distance to the penultimate segment. There are, at least, three rows of dorsal pores although they are not prominent." (Herrick).

Life history. The winter is passed by this insect in a partly grown, dormant condition. On the approach of warm weather winged males and early in the summer the young appear, which are brought forth alive. In the latitude of Washington there are 4 or 5 generations, but farther north there are fewer. In parts of New York there are 3 generations. Owing to the few

localities from which it has been recorded and the limited number of observations made upon this species in Maine nothing can be said in regard to the number of generations occurring during a single season. This insect occurs upon a large number of trees and shrubs in nearly every state in the Union. Specimens have been seen by the Entomologists of this Station from Limerick, West Baldwin, Wells, and Millvale.

Remedies. Spraying with lime-sulphur late in the winter or early in the spring before the appearance of the leaves will control the pest, provided the work be thoroughly done. Oil emulsions when applied by experienced men are also effective.

Aulacaspis rosae.

THE ROSE SCALE.

Bouche, Naturg. Ins. p. 14, 1834.

Herrick Tech. Bul. No. 2, Miss. Agr. Expt. Sta., 1911.

"*Scale of female.* White, often with a yellowish tinge and circular or irregular when crowded. The light yellow exuviæ are to one side of the center, in fact, quite near the edge. Diameter, 2 mm. to 3 mm.

"*Scale of male.* It is long, white, and tricarinated. Length 1.25 mm. to 1.4 mm.

"*Female.* The body is long with the anterior end, consisting of head and thorax, large and wide. The abdomen is plainly segmented with the ends of the segments projecting and those of the two preceding the last bearing 8 to 10 gland spines. There are three pairs of lobes. The median lobes are large, approximate at base but diverge laterally. They are attached to the pygidium the whole length of their lateral margins and are serrate on the inner margins. The second and third lobes are lobulated, the inner lobule always the larger. Beyond the third lobes is a double lobe-like projection marking the projection of the second pair of projecting pores. There are three pairs of conspicuous projecting pores with a single one between the median and second pairs of lobes. The plates are long and stout and situated as follows: one on the lateral base of each of the three pairs of lobes, one beyond the third pair of pores, and two usually, sometimes more, beyond the third pair of pores. There is a small seta on the median, second, and third lobes, and one just beyond the second and third pairs of pores. The dorsal pores are in three rows. The circumgenital pores were as follows in eight specimens:

15	18	12	8	16	15	17	14
24—24	21—23	23—?	31—28	27—26	25—24	24—27	22—24
20—19	24—20	27—22	25—26	21—22	23—25	26—29	21—22

"The lateral groups are often practically continuous." (Herrick 1911).

Life history. In the south this species hibernates as an immature insect but in the latitude of New Jersey and northward it winters in the egg, which hatches on the approach of spring. The species is not limited to the rose but thrives on pear, strawberry, raspberry, blackberry, etc. In this State both raspberries and blackberries are the principal sufferers. The insect has a wide distribution extending from Canada to Florida and westward to California.

Remedies. If the old raspberry or blackberry canes are regularly cleared out in the fall or spring but little trouble will be experienced from this scale.

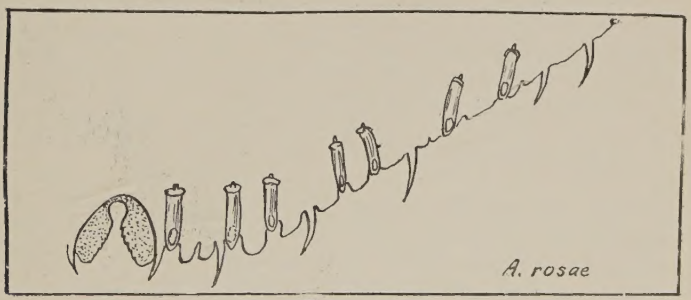

FIG. 477

Lepidosaphes ulmi.

OYSTER SHELL SCALE.

Linnaeus. Syst. Nat. Ed. X. 1, p. 455, 1758.

Herrick. Tech. Bul. No. 2, Miss. Agr. Exp. Sta., 1911.

"*Scale of female.* The scale is dark colored, long, slender, often curved and usually widest at the posterior end. It is tough, composed of concentric layers and thus resembles an oyster shell. The exuviæ are yellowish or yellowish-brown and quite prominent. 2.5 mm. to 3 mm. in length.

"*Scale of male.* It is like that of the female except smaller and the posterior part lifts up like a flap for the exit of the male when full grown.

"*Female.* The body is long and slender with the abdominal segments prominent. The median lobes are wide and prominent, stand far apart and have their edges straight and parallel. The distal ends are round and prominently notched on each side. The mesal lobules of second lobes larger. The third lobes are rudimentary. The plates are long and pointed. There are two between each pair of lobes and two pairs beyond the third lobes. There is a prominent marginal pore between

median and second lobes, two laterad of the third pair of plates, two laterad of the fourth pair of plates and one laterad of the fifth pair of plates. There is a seta on each basal margin of the median lobes, one between the lobules of the second lobes, one just beyond the first and second pairs of marginal pores, and one between the plates of the fifth pair. The dorsal pores are as shown in figure 478. There are five groups of circumgenital pores as follows:

9	9	11	12	
16—21	18—21	15—16	17—15	
15—13	9—11	14—15	13—12"	(Herrick 1911)

Life history. This insect has long been known in this country, though believed to be a native of Europe. In June the eggs,

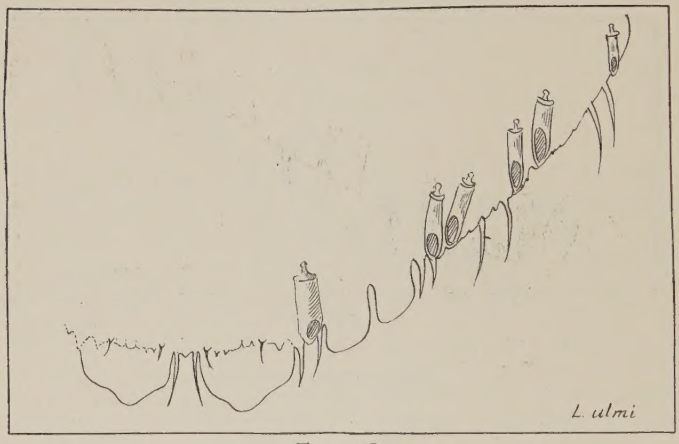

FIG. 478.

which are found under the scale of the old female, hatch, the active young appearing as small specks which soon attach themselves to new shoots by their beaks. The scale then begins to form gradually increasing in size. As with the San Jose scale the adult male is provided with both wings and legs.

The scale occurs nearly everywhere in the United States as well as in other parts of the world, and may be found on a variety of plants. The apple, pear, plum, cherry, currant, willow, elm, birch, butternut, dogwood, ash, oak, linden, poplar, and rose being particularly affected.

It is the most common scale on the apple in Maine.

Remedies. As the insect winters in the egg stage it is quite resistant to sprays, yet experience has shown that when lime-

sulphur is used in early spring for several successive seasons the scales gradually decrease in number. Oil emulsions and soap solutions are both to be recommended, when applied just after the eggs hatch, but precautions must be taken in spraying young trees with an oil emulsion to make the application in sunshiny weather lest the trees be injured.

Chionaspis furfura Fitch.

THE SCURFY SCALE.

Fitch, 3rd Report, Ins. N. Y. p. 352, 1856.

Cooley, Spec. Bul. Mass. Exp. Sta. p. 23, 1899.

Herrick. Tech. Bul. No. 2. Miss. Agr. Exp. Sta., 1911.

"*Scale of female.* Usually grayish, often snow-white, and rather irregular in shape. Apt to enlarge just beyond second exuvium and bend to right or left. It is delicate in texture, flat and thin, and broad posteriorly. Length 2.6 mm. to 3.2 mm.

"*Scale of male.* It is small, snowy-white, narrow, tricarinated, and usually straight. Length .7 mm. to 1 mm.

"*Female.* There are three pairs of lobes, all of which are striated, especially the median ones. The median lobes are large, rounded, and entire. There is an oblique bar at the base of each and often an elliptical, chitinous ring is seen at their inner mesal bases. The second lobes are divided, with the inner lobule the larger, and usually with its mesal margin more or less chitinized.

"The third lobes are also divided but are always small and often obsolete. The inner lobule, at least, is usually serrate. There is a seta on the lateral margins of the median lobes at their bases, one on the outer lobules of the second and third lobes, and one just beyond the second pair of marginal pores. The plates are as follows: 1, 1, 1, 1, 4-9. The first plate is small and may be wanting, or at least is often missing. The circumgenital pores are as follows:

12	8	8	10	9	
27—33	27—27	20—22	30—25	23—22	
25—22	25—25	16—15	23—27	17—18"	(Herrick 1911).

"*Remarks.* This species was found on apple in Mississippi and on Crataegus in Texas." (Herrick 1911).

Life history. The winter is passed in the egg underneath the scale of the female. As with the Oyster shell scale the young hatch in June and soon fix themselves by their beaks either upon the bark of the tree or upon the fruit. In the south it is stated to have 2 or 3 generations per season, but in the north there is but one generation. The species is said to occur in

Maine although no specimens have been seen by the Station Entomologists from any locality within the State. It occurs in many states in the Union as well as in New Brunswick, Ontario, Nova Scotia and Prince Edward Island, so its presence in Maine would not be surprising.

Its food plants are apple, pear, cherry, quince, crab, peach, black walnut, mountain ash, elm, currant, hawthorn, etc.

Remedies. Same as for the Oyster shell scale.

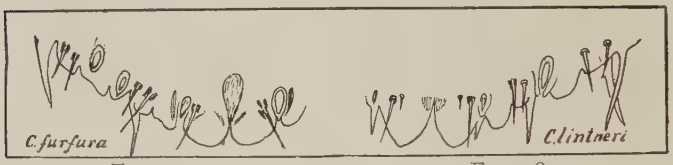

FIG. 479. FIG. 480.

Chionaspis lintneri Comstock.

LINTNER'S SCALE. (FIGS. 480 AND 486.)

Comstock. Cornell Exp. Sta. II, p. 103, 1883.

Cooley. Special Bul. Mass. Agr. College, p. 22, 1899.

"*Scale of female.* Length 2.5-3.2 mm. (⅛ inch). Decidedly broadened posteriorly, somewhat flattened, usually thin and flexible; dull dirty white or snow-white in color. Exuviæ 1 mm. long, yellowish-brown. * * * * The second exuvia is .8 mm. long.

"*Female.* Median *lobes* obscurely pointed and faintly serrate. Second and third pairs with the inner lobule larger than the outer; faintly serrate. The *gland-spines* are long and slender and are arranged as follows: 1, 1-2, 2, 1-3, 6-9. Second row of *dorsal gland-orifices* represented by the anterior group consisting of 3-6 orifices. Third row with 4-6 orifices in the anterior and 5-7 in the posterior group. Fourth row with 6-8 orifices in the anterior and 8-10 in the posterior group. Median group of *circumgenital gland-orifices,* 11-19; anterior laterals, 25-42; posterior laterals, 19-28.

"*Scale of male.* Length .8-1 mm. Parallel-sided, distinctly tri-carinate. Exuvia yellow or almost colorless, occupying about two-fifths of the length of the scale." (Cooley 1899).

This scale has been recorded from alder, willow, birch, dogwood, shadbush. It occurs in eastern United States and Canada, having been recorded from New York, Massachusetts, Maine, Prince Edward Island, and Quebec. The species was found on the gray birch at Orono, Me., in August 1910.

Gossyparia spuria Modeer.

THE ELM SCALE. (FIG. 500.)

Modeer, Act. Goth. I, p. 43, 1778.

Felt. Ins. Affecting Park and Woodland Trees. I, 203, 1905. Doten. Bul. No. 65. Agr. Expt. Sta. Univ. of Nevada, 1908.

This scale is frequently mentioned in literature under the name of *Gossyparia ulmi.*

"Description. The adult females are by far the most conspicuous form of this insect. They may be seen clustered along the under side of the smaller limbs, usually beside a crack or crevice in the bark, and presenting a general resemblance to a growth of lichens. The full grown, viviparous females are about 1-10 inch long just before giving birth to their young, oval in outline and with slightly pointed extremities. Each is surrounded with a white, wooly secretion, which also extends partly over the insect and thus renders its segmentation more apparent.

"The young are yellowish specks and may easily be recognized as they move over the younger limbs and leaves. They have an elongated, oval form, rounded anteriorly and tapering posteriorly to a pair of pointed processes, each bearing a long and a short seta. The body segments are marked by lateral spines and there is a row of six around the anterior border of the head and an irregular row down the middle of the back. The young soon become darker and finally assume a yellowish red color. The dorsum becomes covered with a spiny, wax secreting processes, and the general form of the young larva is retained The antenna of the female before impregnation is composed like that of the young, of 6 subequal segments, the second and third being the longest and the fourth and fifth shortest. The antenna of the immature male has 6 nearly equal segments and a longer seventh. * * * The presence of the perfect insect within may be known by the two long, protruding anal filaments. The male is not seen without special search. It is a delicate, two winged, reddish insect with rather large antennæ, and a pair of white anal filaments nearly twice the length of its body. It moves slowly over the limbs in a clumsy way, is not easily disturbed and rarely takes wing. A most interesting feature is the occurrence of two forms. The normal one has already been described, but 10 days earlier than its occurrence there may be found large numbers of males which are characterized by the possession of wing pads but no wings. These are known as pseudimagos. The reason for the existence of two forms of males is unknown." (Felt 1905).

Life history. The winter is passed as partly grown insects which are well protected by the waxy secretions. In the spring they become active and do the most damage. The young, which are brought forth alive, make their appearance in midsummer, settling on the leaves from which they migrate at the approach

of fall, to the twigs and trunk where they spend the winter. This insect has a wide distribution in the United States occurring both east and west of the Mississippi. They were very abundant in the vicinity of Orono, Maine, last year (1912) being especially conspicuous during early summer upon the trunks around the pruning wounds of the American elms.

Remedies. As for the Oyster shell scale.

Phenacoccus acericola.

MAPLE PHENACOCCUS. (FIG. 481.)

King. Canadian Entomologist. XXXIV, p. 211, 1902.

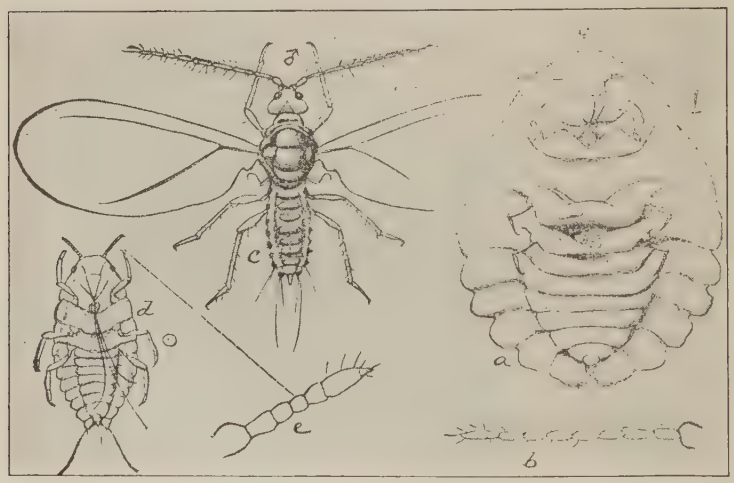

FIG. 481. *Phenacoccus acericola:*. *a*=adult female, greatly enlarged; *b*=antenna of same still more enlarged; *c*=adult male, greatly enlarged; *d*=young larva, greaty enlarged; *e*=antenna of same still more enlarged. (After Howard. Insect Life. 1894. 7 : 237).

Comstock. U. S. Dept. Agr. Rept. '80, p. 345, 1881. (*P. aceris*).
Felt. Insects Affecting Park and Woodland Trees, 182, 1905.

"Our American species when seen on the leaves appear as an irregular oval cottony mass which adheres to anything touching it and resembles very much the cottony ovisac of a *Pulvinaria*.. The cottony material is about 6 mm. in diameter and covers the insect and her eggs.

"Length of ♀ about 5 mm. long, 3 broad, plump, light yellow. Boiled in caustic potash, they turn orange red. The internal juice pressed out, the skin is colourless. The upper surface of the body is more or less covered with spinnerets and these are more dense at the posterior

extremity. The margin of the body has several groups of short spines. Antennæ 9 jointed, measuring in microns.

"Joints	1.	2.	3.	4.	5.	6.	7.	8.	9.
	44.	44.	44.	30.	40.	32.	32.	28.	64.
	44.	44.	44.	32.	44.	32.	28.	28.	64.

Joint 9 is longest, 3 and 5 equal, 6 and 8 usually equal, 1 and 2 and 3 are equal and longer than any of the next five joints. The last sending in the fall, when the leaves were found on the ground, had well advanced females with their abdomen well filled with eggs, and when cleared with potash they showed only an 8 jointed antenna as follows:

"Joints (1) 40. (2) 60. (3) 48. (4) 72. (5) 40. (6) 40. (7) 28. (8) 60. Middle leg, coxa 120, femur and trochanter 240, tibia 200, tarsus 80. The legs are somewhat slender, and the claws are thin, sharp, thickened at the back, but not toothed as described by Prof. Comstock." (King 1902).

Life history. The adult females occur on the leaves in summer, and are about 1-4 inch in length. The adults are concealed by an oval mass of powdery wax within which is the yellowish female and her eggs. The young usually remain on the leaf to feed. The males form oval cocoons under the bark of the tree. The adult females leave the leaves and wander about upon limbs or trunk and after pairing settle on the underside of the leaf, seldom crowding each other. The waxy secretion soon becomes very dense and eggs, which are very numerous, are pushed into it. In some states there may be 3 generations each year. The last generation passes the winter on the trunk.

During the early summer of 1912 a number of the maples on the Campus of the University of Maine were found to have on the trunks under the rough bark large numbers of the wax covered gravid females, the young later appearing on the leaves.

This insect has a wide distribution having been recorded in many of the northern states east of the Mississippi river. Its host plants are maple, hornbeam, lime, and horse chestnut.

Remedies. Controlled by the same methods as the Oyster shell scale.

Phenacoccus dearnessi.

King, Canadian Entomologist, XXXIII, p. 180, 1901.

"Sac white, the sac wholly covering the body. ♀ dark red-brown. Boiled in caustic potash the derm is colourless. Legs and mouth-parts ochreous. Antennæ pale yellow, 9-jointed; 3 longest, although 2 + 3 are sometimes equal, 9 next and a little longer than 1, 5 + 8 next and

equal, 6 + 7 are shortest and equal. The joints are quite variable in length, as will be seen from the following measurements:

Joint	1	2	3	4	5	6	7	8	9	
	40	56	60	28	44	36	36	32	60.	Formula (39) 215 (67) 84.
	40	60	60	32	26	28	28	32	52	" (23) 915 (48) (67)
	40	52	52	40	40	28	38	32	52	" (239) (145) 8 (67)
	44	56	52	24	36	32	56	60		an 8-jointed form, hardly adult.

Legs short, stout.

Middle leg: coxa, 80; fem. with troch., 180; tibia, 116; tarsus, 72; claw, 24.

Hind leg: coxa, 88; fem. with troch., 200; tibia, 148; tarsus, 84; claw 24.

Scattered over the body are several long thin hairs and short thick spines. The gland-pits are not numerous, and are very small. Caudal tubercles, large, round, with two long setæ, and several long thin hairs; the tubercles are well covered with short, stout, spear-shaped spines. Young larva: Antennæ 6-jointed, measuring as follows: Joint—(1) 24. (2) 32. (3) 40. (4) 24. (5) 24. (6) 68." (King 1901).

Life history. The life history of this species resembles that of the foregoing. The immature insects of both sexes hibernate under the rough bark of the host plant. In the early summer the eggs are laid, the young soon migrating to the under surface of the leaves. This species has been recorded from the haw and the apple. On April 29, 1912, some twigs of the gooseberry infested with this species were received from Brunswick, Maine. The twigs were covered with the puparia of males which are small elongate, and felted, as well as a few females. On May 4 to 6 the winged male adults appeared. On the 8th of May a few females were transferred from the drying gooseberry twig to the stem of a young currant bush growing indoors. One of the females (Fig. 490) laid eggs on June 11, numerous young soon appearing and settling on the underside of the leaves. Eggs from one of the other females were later also obtained some of which were transferred to young plants of apple, elm and maple, greenhouse grown. The eggs soon hatched, the young settling upon the underside of the leaves and thriving as well as upon the original host. As the experiment was discontinued in September nothing can be said of the subsequent development. This insect has been found in a few northern states as well as in Canada.

Remedies. Same methods as for preceding species.

Eulecanium corni.

THE EUROPEAN FRUIT LECANIUM.

Bouche. Stett. Ent. Zeit. V, p. 298, 1844.

Sanders. Journal Ec. Ent. pp. 428-447, II, 1909.

The following names are all synonyms, according to Sanders: Adenostomae, armeniacum, assimile, aurantiacum, canadense, caryarum, cerasifex, coryli, corylifex, crawii, cyosbati, fitchii, fraxini, guinardi, juglandifex, kansasense, kingii, lintneri, maclurarum, mori, obtusum, pyri, rehi, ribis, robiniae, rosae, rugosum, tarsale, tibiae, vini, websteri.

"This common species which occurs on so many of our economic and wild trees and shrubs, is quite convex in form with irregular, varying rugosities and pits in the hard brown derm of the adult, or dead female. Various fuscous transverse and longitudinal markings are evident on the young adult female scale before oviposition in early summer. These markings rapidly disappear at her death and darker brown suffuses the derm, leaving sometimes a trace of fuscous on the dorsum.

"The cleared derm appears brownish, antennæ 6 or 7-segmented, usually the latter; legs well developed, ordinary; anal plates heavily chitinized, together forming nearly a square; 6 large and 2 small hairs on the anal ring; marginal spines rather short and stout 18-24 mmm. in length; spiracular spines variable, rather slender, the shorter ones 30-40mmm. and the middle one 50-60 mmm. in length. The cleared derm shows extra heavy chitinization of the regions along the anterior margin extending inward toward the antennæ, and also of the posterior lobes near the cleft. The characteristic general arrangement of the many derm pores in very irregular, broken and interrupted radiating rows, is especially noticeable near the margin. In some specimens this character is not so marked." (Sanders 1909).

This insect, if the above list of synonyms be accepted, occurs in many states on a very large number of shrubs, fruit and shade trees including the apple, plum, peach, apricot, pear, currant, blackberry, mulberry, sage, orange, elm, ash, locust, linden, maple, dogwood, etc. In Maine we have found it on elm, ash, maple, honey locust, apple, rose, and bitter sweet. Fig. 488 shows specimens of Lecanium collected on red ash, Orono, July 12.

Remedies. Thorough spraying with a crude oil or a distillate oil emulsion applied as a winter treatment. The crude oil emulsion is prepared according to the following formula. (See Bul. 80, Pt. VIII. Bur. of Ent. U. S. Dept. Agr.)

"Water	gallons	86
Fish-oil soap	pounds	10
Lye	do	2
Crude oil (16° to 22° Baume)	gallons	12

About 20 gallons of the water were heated, and when this began to boil the dissolved soap and then the lye were added. This mixture was then removed to the tank, and the rest of the water (66 gallons) added, making 86 gallons in all. The spray pump engine was then started and the crude oil slowly poured into the tank, the mixture being violently agitated by the tank agitator. A perfect emulsion resulted."

Pulvinaria vitis. (Fig. 489).

Linnaeus, Syst. Nat. I, 741, 16, 1735.

Newstead, Monog. Brit. Coccidae, II, p. 51, 1903.

Pulvinaria innumerabilis of American authors is a synonym.

"Female at period of parturition more or less cordate, narrowest in front, posterior extremity emarginate, anal cleft deep; transversely wrinkled and punctate; dorsum slightly ridged, and where the transverse wrinkles are deepest they often form conspicuous projections. Colour pale to dark chestnut-brown, with a median line of pale ochreous or brownish red. At the completion of the ovisac the extremities of the body curve upwards and inwards, the cephalic area only remaining attached to the food-plant. So much is the body wrinkled at this stage that the dermis has often the appearance of being deeply folded. After parturition the colour changes to a uniform pale or dark chestnut-brown, and the dermis is slightly shining. Antennæ normally of eight joints, but there are sometimes only seven. Formula 3, 4, 5, 2, 8, 1 (6, 7), or (3, 5), (2, 4), (6, 7), 8, 1. In all the specimens the second joint possesses a very long hair, and there is a slightly shorter one on the fifth joint, and on the terminal one are five or six. Legs ordinary; digitules to tarsus simple, those of the claw rather strongly dilated. Loop of rostrum scarcely reaching insertion of intermediate legs; mentum uniarticulate and small. Dermis with numerous ovate or approximately circular pores, and fine pentagonal tesselations, which usually disappear in boiling caustic potash. Marginal hairs small, slender, and generally curved. Stigmatic channel with minute circular spinnerets; marginal spines in a group of three, of which the centre one is much the longest and very slightly curved. Anal ring of eight hairs, enveloped, as in the genus *Lecanium*, in a thin and finely striate tube, which partly obscures the hairs of the anal ring within. Anal lobes with several fine hairs at the apex.

"The young adult female exactly resembles a *Lecanium*. Colour, under a lens, ochreous or dark yellow, rendered almost obscure by more or less confluent black spots; dorsum with a median ochreous or dull crimson band; to the naked eye the females appear dark smoky-brown in colour, with a faint olivaceous tinge, but the dorsal band is usually distinct.

"Larva with the antennæ of six joints; formula (3, 6), 2 (1, 4, 5). Legs ordinary. Anal ring with six hairs." (Newstead 1903).

Life history. The smaller twigs of maples or other trees are often covered on the underside with cottony masses which protrude from under a brownish scale. The female lays her eggs about midsummer, the young emerging from the cottony egg mass, establishing themselves along the veins on the underside of the leaves, or more rarely on the more tender twigs. In the autumn the insects migrate to the twigs before the leaves fall. The males die soon after mating; the females pass the winter on the underside of the twigs, and in the spring increase in size, secrete a large amount of honey dew which smears the leaves and everything beneath the infested trees. Later in the spring the insects begin to secrete the cottony matter in which the eggs are deposited.

The insects are found in many parts of the United States and Canada. On June 27, 1912, specimens of females with the cottony egg mases were received on maple twigs from Mr. J. W. Burke, Lee, Maine.

The host plants are maple, linden, sycamore, locust, sumac, beech, elm, oak, apple, pear, box elder, alder, hawthorn, grape, willow, and others.

Remedies. As for the Oyster shell scale.

Table Giving the Differential Characters of the Scale Insects Described in the Foregoing Account.

a. Posterior margin of the abdomen of the female with lobed or serrate pygidium (figs. 475-480); legs wanting in the adult.
  b. Cover scale of female circular.
    c. Exuviae nearly central.
      d. With circumgenital pores (fig 475). *Aspidiotus ostreaeformis.*
      dd. Without circumgenital pores (fig 476). *Aspidiotus perniciosus.*
    cc. Exuviae nearly marginal (fig. 477). *Aulacaspis rosae.*
  bb. Female scale elongate or oval.
    c. Female scale rather narrow, often curved (fig. 478). *Lepidosaphes ulmi.*
    cc. Female scale oval, scarcely twice as long as wide.
      d. Median lobes of pygidium very broadly rounded at the extremities and set close together. (fig. 479). *Chionaspis furfura.*
      dd. Median lobes more spreading and indistinctly pointed. (Fig. 480). *Chionaspis lintneri.*

aa. Abdomen of adult female without a pygidium.
  b. No anal cleft nor triangular plates at posterior end of abdomen of female; antennæ and legs present in adult.
    c. Newly hatched nymphs with rows of dorsal spines, adult surrounded by cotton but dorsally naked. *Gossyparia spuria.*
    cc. Newly hatched nymphs without dorsal spines; antennæ 9 jointed, 6 setæ in anal ring. *Phenacoccus.*
      d. "Tibia nearly 3 times as long as the tarsi." *P. acericola.*
      dd. "Tibia less than twice as long as the tarsi." *P. dearnessi.*
  bb. Adult female with an anal cleft and triangular plates at posterior end of abdomen.
    c. Adult female is naked, more or less convex and hemispherical, scale-like, hard when mature. *Eulecanium corni.*
    cc. Secretion of female more or less cottony, ovisac posterior and adherent to twig and leaf. *Pulvinaria vitis.*

PLANT LICE.

*Aphidae.**

Among the most troublesome of the Aphides of the season were rather conspicuously those upon plum trees, currant bushes, apple trees, and elms. More detailed records of these either have been or will be given in other publications, but a few items seem to fall naturally into this bulletin.

Especial preparations had been made for migration tests with *Prociphilus venafuscus* but only a few colonies on *Fraxinus* were found this season and those were too well attended by predaceous enemies to be profitable for experimental purposes. A few colonies of this species were also found upon *Forsythia* bushes on the campus. Spring migrants were placed upon Balsam Fir seedlings in pots and in one instance a few of the progeny stationed themselves upon exposed roots and fed, normally secreting honeydew and white wax for a few days. These soon died and no conclusive data was obtained. Late in the season apterous aphides which I believe to be this species were abundant upon roots of young Balsam Firs near Orono but no pupæ were found and no developing winged forms so that again the conclusive link was lacking.

Aphis bakeri was taken on *Crataegus* in the spring and the progeny of the spring migrants responded properly to clover tests, maturing and producing there quite content. A colony of this species was brought into the Station on sweet peas.

* Notes by Edith M. Patch.

This colony was on the stem near the ground and was only a few rods from *Crataegus* from which I had collected *bakeri* in the spring.

* * * * * * * * *

It may not be out of place at this time to add an ecological note on *Schizoneura lanigera* in the form of a problem needing further study. That is what is the fate of such winter eggs of *lanigera* as are sometimes deposited on the bark of apple? That this question is of more biological than economic interest is shown by the significant wholesale flight of the sexuparae (fall migrants) *away* from *Pyrus* which provides for the normal deposition of the true sexes and winter eggs on the true winter host with *lanigera* as is the case with other migratory aphides.

But where woolly aphid colonies are very thick, sexes and the winter eggs are sometimes found upon the apple. That such occurrences are accidental * seems not improbable but whether the emerging stem mothers of *lanigera* can develop on apple or other *Pyrus* and if so whether she is a bark feeder or whether she curls an apple leaf (as she would an elm leaf in her ordinary situation) and what the characters of her progeny are, seem to be few of the points which it would be of no slight biological interest to know.

Although I have no observations to offer on the deposition of *S. lanigera* eggs on *Pyrus,* I have been more than a little interested in accounts of such occurrences which have recently been sent me and also in the published records, the earliest of which, for this country at least, seems to be that in the Report of the Entomologist of the United States Department of Agriculture for the year 1879 by J. Henry Comstock. On page 259 of this Report Dr. L. O. Howard recorded his observations made in a little orchard of Russian apple trees then on the grounds of the

* I have seen *Prociphilus venafuscus* fall migrants collect on both *Ulmus* and *Pyrus* sometimes in great numbers where they gave birth to true sexes and where winter eggs were deposited but so far as my observations have gone the spring stem mother develops only on *Fraxinus* and relatives (as *Lilac* and *Forsythia*) so that a deposition of the winter egg in any other situation than on the true winter host is apparently an accidental "error" on the part of the fall migrants which are responsible for the safe disposal of the true sexes on the appropriate winter host.

Department of Agriculture at Washington, his statement concerning the winter egg being as follows:—

"The winter egg was found on several occasions during the winter in crevices of the bark over which a colony had been stationed during the summer. It was a rather long ovoid, measuring .322 mm. (.125 inch) in length and was very similar to the winter egg of *Colopha ulmicola* (Fitch), as described by Riley in Bulletin No. 1, Vol. V, Hayden's Survey.

"This egg was laid, as Professor Thomas supposes, by a wingless female, differing from the ordinary agamic form to a certain extent. These females we only know from finding their skins around the winter egg, since they often die without depositing it. The males we have not seen."

An attempt was made to include in the bibliography of Bulletin 203 of the Maine Agricultural Experiment Station references to all original observations on the *Ulmus-Pyrus* Schizoneuran but other omissions besides the interesting note just quoted may have occurred in which case *addenda* from any one noticing them would be very gratefully appreciated.

LEPIDOPTERA.

BUTTERFLIES AND MOTHS.

Euvanessa antiopa.

THE YELLOW EDGE BUTTERFLY.

Specimens of the larva of this insect were perhaps more frequently received for identification by the Station this year than any other single species, as it was unusually abundant in many parts of the State. The eggs are yellow with white ridges and are attached in masses encircling the twig. Such a mass was found near the swelling leaf bud of elm, May 11 at Orono.

As a circular descriptive of this insect may be had upon application to the Station further details are here omitted.

Ctenucha virginica.

THE VIRGINIA CTENUCHA.

This beautiful little moth, with its blackish wings extending from 1 3-4 inches to 2 inches, peacock blue body and red head makes it a conspicuous object (fig. 493.) It is not uncommon in Maine, and was unusually abundant this season. The larva somewhat resembles that of the spotted tiger moth, but like

other members of the family it feeds upon grasses and thus its habitat serves as a ready means of distinguishing it from the tiger caterpillars; and the characteristic hair tufts give good distinctive features if a careful examination is made. This insect hibernates in the caterpillar stage and completes its growth in the spring. On May 2 a collection of these caterpillars in their last instar was received at the Station (fig. 495). They were colored as follows: Body surface purplish black; no dorsal line present but subdorsal and lateral longitudinal line of yellowish white; head shining deep rich wine red with black face and jaws, prolegs reddish, matching head in color but not shining; true legs shining black; hair of 2nd and 3rd thoracic segments inclined down over head; hair of thorax and caudal 2 segments mixed black and white giving gray appearance; dorsal hair of abdominal segments, 1 to 8 inclusive, yellow with a row of 8 black tufts.

In confinement these caterpillars ate grass greedily, the first of them spinning a cocoon and pupating May 4-6, and the others following within a week. The cocoon is a loose oval case, composed almost entirely of the caterpillar hairs (fig. 494). The first moth emerged May 31 and the others emerged on and before June 3. Lot 1455. Hymenopterous parasites (Lot 1474) emerged from part of this lot on June 3.

Euproctis chrysorrhoea.

BROWNTAIL MOTH.

As in former seasons many nests containing larvæ of this species were received for identification by the Station during the winter of 1911-12, but unlike those received in former years, many nests contained only or chiefly dead caterpillars. What caused the death of the insects has not been satisfactorily traced to any single cause which would explain all cases and it is possible that fungous disease, insect parasites, and climatic conditions each were responsible for part of the mortality. Nests from neighboring places would in one case contain dead caterpillars and in the next a fair percentage of live ones. All of the nests from one Orono orchard were examined and found to contain practically only dead caterpillars. Parasites emerged from part of these nests.

Considering the fact that a single winter nest should contain from 150 to 350 or more hibernating larvæ the following record is of interest though it is incidental, as no attempt to canvas the State was made. Curiously the most northern nest received (Monson) contained only living caterpillars.

Partial Record of Winter Nests Received Spring 1912.

Monson, Piscataquis County. 6 nests, 700 larvæ alive.
Cooper, Washington County. 1 nest, 10 larvæ alive.
Bangor, Penobscot County. 8 nests. Most larvæ dead.
Orono, Penobscot County. Many nests (all from 1 orchard). All larvæ dead except a few and those were not vigorous.
Walpole, Lincoln County (1st sending). Many nests. Most larvæ dead.
Walpole, Lincoln County (2nd sending). Many nests. Most larvæ alive.
Auburn, Androscoggin County. 9 nests. Most larvæ dead.
Wales, Androscoggin County. 10 nests. All larvæ dead.
Oxford, Oxford County. 1 nest. 8 larvæ alive.
Freeport, Cumberland County. 4 nests. Most larvæ dead.
Brunswick, Cumberland County. Many nests. All larvæ alive.
Berwick, York County. Many nests. All larvæ alive.

Porthetria dispar.

GYPSY MOTH.

This dreaded insect pest is making its way northward in the State and the egg masses are numerous this fall in the vicinity of Portland.

TENT CATERPILLARS.

Malacosoma americana and *disstria.*

Both the Orchard Tent and Forest Tent caterpillars were unusually numerous in many parts of the State this year. Both species did much damage to the foliage of apple trees, in neglected orchards, both not infrequently being found upon the same tree. The former species constructs large tent-like web nests to which they retire when not feeding. The latter species do not make a tent but instead spin upon the trunk and larger branches of the tree they inhabit a delicate, and inconspicuous sheet of silk upon which they travel up and down. Both species deposit their eggs in the summer in a varnished mass in the form of a ring or belt about a twig. In this State

they remain until they hatch the following spring. They are exceedingly abundant the present season, on one small wild cherry tree at Orono several dozen of these egg masses were seen upon a single twig.

Parasitic flies, *Tachina mella*, were bred from a number of the larvæ of both species taken in the vicinity of Orono this summer. Descriptive circulars giving remedial measures for these two species are issued by the Maine Agricultural Experiment Station.

Dioryctria abietella and *Enarmonia youngana*.

In Insect Notes for 1911 (p. 233) mention was made of injury to red spruce cones by insects. Among the insects found in the cones were the larvæ of 2 species of Tineid moths which were later reared and proved to be the above mentioned species. Lots 1303, 1386 Sub. 6.

Peronia ferrugana.

BIRCH LEAF ROLLER.

Schiffermueller, Syst. Verg. Wien. 128, 1776.
Clemens. Proc. Ent. Soc. Phil. III, 576, 1864. (P. gallicolana).

"Fore wings dull ochreous or whitish tinted with ochreous. Near the middle of the costa is a semi-oval blackish-brown spot containing blackish dots, and sometimes a whitish spot on the costa. Along the interior edge of this costal spot are a few tufts, and near the base of the fold of the wing is a single black one. The costa near the base is slightly marked with blackish and the apical portion of the wing is clouded with reddish-ochreous-reddish. Hind wings shining, rather dark gray." (Clemens).

This common European species which is also found in eastern United States, has been rather abundant in the vicinity of Orono for several seasons. The larva constructs a loose tube of silk within the rolled up edge of a gray birch leaf similar to that shown in figure 180 of Packard's Forest Insects (p. 507). In the leaf axils of the tree upon which the larvæ were found, occurred curious little tubular nests each containing a larva very similar if not identical with the above mentioned species. These tubes are constructed of silk and debris and extend down into the twig which is somewhat swelled at this point (fig. 482). Rübsaamen in the Berliner Entomologische Zeitschrift (p. 63,

Vol. 33, 1889) states that this tubular nest on the Birch is the work of *P. ferrugana.* If there is no error in the identification it is probable that the larva spends its earlier life thus, and later becomes a leaf roller. As we failed to rear adults from this leaf axil inhabitant and did not observe whether the larva later left the tubes to become leaf rollers we cannot prove the identity of the two forms. Our identification of the moth was confirmed by Mr. August Busck of the National Museum. Lot. Nos. 1289, 1411, 1453.

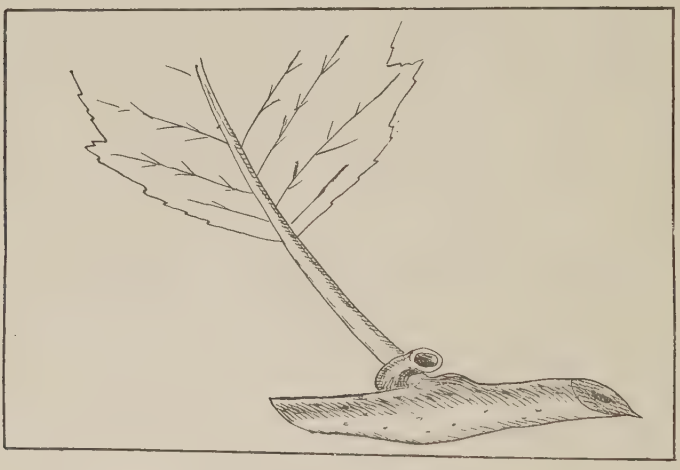

FIG. 482. *Peronia ferrugana.*

A larva forming on the alder a similar axil tube is also not uncommon at Orono, Maine. The twig is less swollen than in the case of the birch, though the projecting tube does not differ.

Olethreutes albeolana.

This species as well as an undetermined *Eucosoma* also construct tubes within the curled edge of gray birch leaves at Orono, Maine. Specimens determined by Mr. A. Busck of the National Museum. Lot 1411a.

Eulia quadrifasciana.

This species was bred from a larva found under the bark of an apple tree at Orono, Maine. Lot 1252.

Apatela funeralis.

The red headed sooty black caterpillars, each segment with transversely elliptical pale yellow mark margined with orange, were found on the Campus at Orono, Aug. 1, feeding on *Cornus stolonifera.* Lot 1553.

Tortrix fumiferana (Spruce bud moth).

Epinotia piceafoliana and *Recurvaria piceaella.*

These Tortricids were bred from larvæ found feeding upon the leaves of red and white spruces, in the spring of 1912 at Orono and elsewhere. An account of their life history will be given in a later bulletin.

HYMENOPTERA.

A PARASITE OF THE BROWNTAIL MOTH.

Monodontomerus aereus. (*Chalcidae*)

Walker, Ent. Mag. II, 158, 1834.

Mayr, Verh. Zool. bot. Ges. Wien. XXIV, p. 71, 1874.

L. O. Howard and W. F. Fiske Bul. 91, Bureau of Entomology, U. S. Dept. Agr. p. 245, 250, 1911.

"Female. Bronze, somewhat shining, quasi squamose, pubescent. Mandibles reddish fuscous; eyes and ocelli reddish; antennæ black, pubescent, first joint bronze; squamulæ reddish fuscous. Abdomen a greenish bronze, smooth, apex sparsely pubescent, not longer than the thorax, apical segment bronzy; ovipositor red, scarcely exceeding half the length of the abdomen; tegmina black, pubescent. Legs reddish fuscous, pubescent; coxæ and femora dusky greenish bronze; tarsi red, paler under the base, tip more dusky. Wings hyaline, iridescent; veins fuscous, stigma moderate in size. Length of body about 1-8 inch, wing about 3-16 inch." (Walker).

The occurrence of this parasite of the Browntail moth at Walpole, Maine, was noted in Insect Notes for 1911 (p. 243, Bul. 195, Maine Agr. Exp. Sta.). Other Maine localities from which the species has been taken either by us or by the representatives of the Bureau of Entomology, U. S. Dept. of Agriculture, are Stroudwater, Leeds Center, Bridgton, Vassalboro, Richmond, Brunswick, Freeport, Poland, Gray, Windham, Portland, Sebago, Cornish, Wells, Berwick, York, and Kittery.

This species was imported from Europe and distributed in Massachusetts about 6 years ago by the entomologists engaged in the gypsy and browntail moth investigations. Since that time the insects have gradually spread until now it has a wide distribution in northern New England. The females (figs. 483 and 499) have the habit of hibernating in the winter webs of the browntail moth, not attacking the caterpillar stage but are parasitic upon the browntail moth pupæ.

FIG. 483. *Monodontomerus aereus.* Greatly enlarged. (After Howard and Fiske, 1911).

As a period of about 2 months must elapse from the time of the escape of the parasites from the winter webs until the caterpillars of the browntail moth pupate, the little parasite must live in the open during the interval. There seems to be but one generation a year. The female deposits her eggs in the browntail moth pupæ in June, the developing young feeding internally. When mature they escape from the pupæ, the females in the fall seeking shelter in the new winter nests of the young browntail moth caterpillars.

Measures for protecting the parasite. The present method of destroying the browntail moth nests in midwinter while effective in killing the caterpillars, also destroys these parasites if present. A modification of this method could well be made by which the parasite is allowed to escape before the destruc-

tion of the nests. As heretofore the nest should be removed from the orchard or shade trees during the winter but they should be held and kept under normal outdoor conditions until the first warm days of spring when both parasites and caterpillars become active. As the parasite is the first to emerge from the nest, the nest could be destroyed as soon as the caterpillars are seen to be actively congregating on the outside. The nests as soon as cut from the tree may be placed in a barrel or other receptacle, the outside of which, at some distance from the top edge, should be smeared with a band of tree tangle foot or some similar preparation so that if the caterpillars start to creep down the side they will be checked by the sticky substance. The parasite, a small shiny black 4-winged fly, about 3-16 of an inch in length, would fly off unharmed if the tangle foot is not placed too near the upper edge. It is suggested that these barrels be placed in the vicinity of wood lots in which browntail nests are still known to exist. The parasites would thus aid in reducing the infestation in the wood lands as well as being enabled to breed and spread.

Pteromalus egregius. (*Chalcidae*)

Förster, Beitr. Monogr. Pteromal. p. 22, 1841.

L. O. Howard and W. F. Fiske. Bul. 91 Bur. Ent. U. S. Dept. Agr. 1911.

"Female. Dark green, scape at the base and the legs reddish yellow, femur dark green with yellow apex, the posterior tibiæ brown in the middle. Propodeum shining, at the base coarsely punctate, on each side with an elongate furrow; the middle transversely depressed, and with a row of deep furrows, the apex smooth, transversely aciculate. Abdomen green, with violet fasciæ. Length 1-8 inch." (Förster).

This little parasite of the browntail moth, also imported from Europe by the Entomologists of the U. S. Dept. of Agriculture about 6 years ago has been gradually spreading northward. In 1911 it was recorded by the government entomologists from Cumberland County, Maine. In March 1912, a number of specimens were obtained from winter nests which had been collected in an orchard at Orono, Maine. Fig. 484.

The females of this species also enter the web nests of the browntail moth caterpillars, but unlike the *Monodonotomerus* they oviposit upon the caterpillars after these have become

dormant. The developing larvæ then feed externally upon the caterpillars, becoming full fed before cold weather sets in. Transformations are completed in the spring, the adults leaving the web nests 2 or 3 weeks after the caterpillars become active.

Protection of the parasite. The same means may be used as for *Monodonotomerus* only in this case the barrels should be left longer before destroying the webs of the browntail caterpillars.

Pteromalus puparum. (*Chalcidae*)

This little parasite was reared in large numbers from chrysalids of the yellow edge butterfly on several occasions during

FIG. 484. *Pteromalus egregius.* Greatly enlarged. (After Howard and Fiske, 1911).

July 1912. From a single chrysalid collected on the campus of the University of Maine, 87 specimens emerged. Lot 1516.

Elachertes johannseni Crawford. (*Chalcidae*)

This species mentioned in Insect Notes for 1911 (p. 243, Bul. 195 Me. Agr. Exp. Sta.) under the title of *Elachertes* sp. has recently been described by Mr. J. C. Crawford in the Proceedings of the U. S. National Museum, Vol. 43, p. 181, 1912.

Habrobracon johannseni Viereck. (*Braconidae*)

The species noted in Insect Notes for 1911 (p. 243, Bul. 195, Me. Agr. Exp. Sta.) under the name of *Bracon* sp. has recently

been described by Mr. H. L. Viereck in the Proceedings of the U. S. National Museum, Vol. 42, p. 622, 1912.

ANT SWARMS.

Some male and female winged ants were received from Squirrel Island Aug. 28 with the following account by the collector. Mr. Alex Doyle.

"They invaded this island last Sunday. They seemed to come in numerous different swarms from over the water,—from the east or northeast. Each swarm was so dense as to present the appearance at a distance of 1-2 to 3-4 mile of small clouds floating across a clear sky. They drifted by my house so floating across a clear sky. They drifted by my house so thickly that by reaching out the hand or a cap from the piazza they could be captured, yet not one entered the piazza."

COLEOPTERA.

BEETLES.

Haltica bimarginata.

ALDER FLEA-BEETLE.

Say. Journal Phil. Ac. Nat. Sci., IV, 1824.

"*Larva.* Body somewhat flattened; head scarcely two-thirds as wide as the body in the middle; black, becoming brown in front near the jaws. Body livid brown above; the tubercles black; paler beneath; with three pairs of black jointed thoracic legs; no abdominal legs; but an anal prop-leg. The abdominal segments each with a transverse, oval-rounded, ventral, rough space forming a series of creeping tubercles, and in front on each segment is a transverse, oval, crescentic chitinous area bearing two piliferous tubercles; the back of each segment divided into two ridges, each bearing a row of six sharp tubercles, bearing short hairs; a single ventral row on each side of the ventral plate. Length 7 to 10 mm.

"*Pupa.* Body rather thick, white. Antennæ passing around the bent knees (femero-tibial joints) of the first and second pair of legs, the end scarcely going beyond the middle of the body. Elytra with five or six rather deep longitudinal creases. The salient points of the body armed with piliferous warts. Abdominal tip square at the end, with a stout black spine projecting from each side. Length, 6 mm." (Packard's Forest Insects p. 631).

"*Adult.* Oblong, subparallel. Above dark blue, moderately shining; under surface and legs blue-black, antennæ piceous. Thorax wider than long, margins very narrow, the ante-basal depression deep, reach-

ing the sides and joining the marginal depression; surface distinctly alutaceous, sparsely punctate. Elytra wider at base than thorax, with a prominent fold extending from umbone to near apex; surface finely, rather sparsely and indistinctly punctate. Length 5-6 mm." (Blatchley's Coleoptera of Indiana).

We found this species very abundant during the past season at Orono, Castine and Monmouth, and it has also been reported from other localities. The larvæ were very numerous on the leaves of the alder (Alnus incana) during July about Orono, skeletonizing the leaves. Sometimes half a dozen larvæ were found at work upon a single leaf. The insects pupate early in August, adults appearing during the first weeks of September. The description of the larva given above, which was taken from Packard's "Forest Insects," was evidently drawn up from alcoholic specimens. In life the ground color is dark brown, or sometimes almost black, with bluish black tubercles.

WIRE WORMS IN CORN.

Agriotes mancus.

Say, Jour. Phil. Ac. Nat. Sc. III, 171, 1823.
Comstock and Slingerland. Bul. 33, Ag. Exp. Sta. Cornell
Horn. Can. Ent. Vol. 4, p. 6, 1872.
Forbes, 18th Report, 1894.

"*Larva.* The newly hatched larvæ must be very small, and, according to European writers, they grow very slowly. The smallest larvæ of the wheat wireworms we have seen were about 4 mm. in length. All variations in size occur at the same time up to a full grown larva which measures from 16 mm. to 19 mm. The larvæ are quite slender cylindrical somewhat flattened on the venter, sparsely hairy, and of a waxy yellow color, lighter at the sutures. The anal segment tapers gradually to a subacute brown point, and bears on the dorsal aspect, near the cephalic border, two large conspicuous, brown eye-like depressions resembling the breathing pores. By these, the wheat wireworm of any size may be readily separated from any other species which we have found infesting fields." (Comstock and Slingerland). Fig. 496.

"*Pupa.* "The pupa resembles the imago in many of its characters, being, however, about one-fourth longer, and in the abdominal region more slender, the only differences of moment being the following:

"Thorax at each angle with a stout bristle-like appendage more slender towards the tip, about a sixteenth of an inch long. That at the anterior angle is supported on a small papilla, the posterior being prolonged from the tip of the angle. Terminal abdominal segment above subquadrate, emarginate at tip, angles acute and divergent, beneath with deep sinuous groove on each side and a median shallower groove.

"Abdomen above and beneath of nine segments, the first very narrow, distinctly visible above, beneath visible only at the sides; second slightly broader, beneath nearly entirely concealed. The remaining segments are distinctly visible both above and beneath, the distal angles being slightly prominent, giving the sides of the abdomen a dentate appearance." (Horn 1872).

"*Imago.* Robust, color piceous to brown, elytra often paler, surface moderately pubescent. Head and thorax very convex, the mouth inferior, mandibles broad and chisel-shaped at tip; surface of head and thorax densely and coarsely punctate; striæ of elytra deep, punctate, interspaces nearly flat, rugose, and punctulate, antennæ and feet rufous. "Length 7-9 mm." (Forbes, 1894). Fig. 498.

In Insect Notes for 1911 (p. 229, Bul. 195, Me. Agr. Exp. Sta.) there was published an account of experiments made at Highmoor Farm, Monmouth, Maine, upon wire worm extermination. Both poisons and repellants were used without avail in the field, and as a check several wire worms were placed in a small jar with some grains with which special pains were taken to coat them heavily with arsenate of lead. Several days later, some larvæ were seen, each half buried within the grain, the hull intact except for a small hole the diameter of the insect's body. A month later only the hulls of the grain remained. All the wire worms were still alive and apparently healthy. (Fig. 497.) Tobacco dust, lime and other repellants also proved ineffectual. The successful growth of Canada field peas in some of the infested plots gave the suggestion that crop rotation would be the solution of the wire worm problem and to that end potatoes, clover, beans, oats, corn, Canada field peas, and a mixture of peas and oats were sown in plots 200 feet in length, but of varying width, separated from each other by fallow areas 8 to 10 feet wide. A narrow strip plowed 6 times during the month of August 1911 was crossed at right angles by the 1912 plots. Owing to the very late spring and wet fields, the planting was unusually late. No fertilizer was put upon the field. About the middle of August the crops were inspected. Making allowance for the lateness of planting and lack of fertilizer, all the crops with the exception of the corn were in as good a condition as could be expected. The corn was rather poor though much better than on the same field the preceding season.

In preparing the field for planting half of each plot was plowed in June, the other half being only harrowed. Wire

worms were abundant in the field especially about the roots of the corn plants, though apparently not as numerous as in 1911. The difficulty in conducting field experiments of this kind is the practical impossibility of having reliable checks which can be tested quantitatively, owing to the numerous uncontrollable factors. Whether the cultivation of the field during the 2 years was the cause of the apparent reduction of the wire worms or whether the weather conditions were most concerned we have no means of knowing.

There was nothing, however, in the experiments in 1912 to invalidate the conviction that continued cultivation and rotation of crops will in the course of several seasons materially reduce the wire worms in an infested field. Certain it is that sod land is always more heavily infested than fields long in cultivation. At Guilford, Maine, a place of worn out sod land newly planted to potatoes produced plants that looked at first glance like those affected with "black leg." Examination showed stems and tubers chewed by wire worms which were seen *in situ*.

A more satisfactory method of testing the food preferences of wire worms would probably be to introduce a sufficient number of larvæ of a known species into pots of the plants to be tested with suitable checks for comparison.

Most of the larvæ found at Highmoor in 1911 were *Agriotes mancus*. In 1912 over 99% of the larvæ examined belonged to this species. On August 7 while digging for larvæ several adults of this species, evidently recently transformed, as well as pupæ were found.

This species which in the middle west is known as the Wheat wire worm because of its depredations upon wheat is also a pest there to Indian corn. The adult insect probably lays her eggs near the roots of grasses and the young hatching therefrom are supposed to require 3 years to complete the life cycle. The larva transforms to the pupa late in July or early in August. The adults emerge from the ground in May or June. There is reason for believing that the pupæ soon transform into adults and that they hibernate underground in this form, and not as pupa.

Hylurgops (Hylesinus) opaculus.

ELM BARK BORER.

Specimens of these scolytid beetles together with a sample of their work on elm were received from Augusta, July 24, Lot 1531.

Xyleborus dispar.

APPLE TREE SHOT BORER.

Complaints of this species accompanied specimens of the beetle and examples of its work in apple bark from Rockport, Aug. 1. Lot 1551. Similar material was received Sept. 10 from Carmel. Lot 1582.

Oberea bimaculata.

CANE BORER.

Raspberries and other canes in Maine are frequently attacked by this borer which gives yearly evidence of its presence. Oviposition wounds in raspberry cane were received from East Boothbay July 17. Lot 1524. Oviposition work in blackberry and adult beetles were received from North New Portland Aug. 1. Lot 1552.

Leptura canadensis.

Specimens of this long-horned borer were received from South Paris Aug. 8, with the statement that "they have made so many holes in a piazza post of southern pine that it looks like a pepper box." Lot 1556.

Galerucella luteola.

IMPORTED ELM LEAF BEETLE.

Hibernating adult elm leaf beetles were received from Biddeford, April 20. Lot 1452. Other sendings of the adults were received from the same place May 16. Lot 1464. Larvæ were received from Eliot July 15. Lot 1515. The experience of other infested states with this imported pest seems to be in store for Maine. Much of the work on elms popularly laid to the door of *Galerucella luteola* in Maine during the past two seasons, however, was done by the larvæ of a blue *Haltica* (Bul. 195, Me. Agr. Exp. Sta. p. 233).

Saperda tridentata.

ELM-BORER.

Packard, Forest Insects, 1890, p. 224.

Forbes, Bul. 154, Univ. of Illinois Agr. Exp. Sta. 1912.

This dangerous enemy of the elm is also at work in the State and specimens were captured on the Campus July 10. Lot 1504.

Packard gives an account of this insect which reads in part:

"Perforating and loosening the bark and furrowing the surface of the wood with their irregular tracks, flat white longicorn borers, changing to beetles in June and July; the beetles flat, dark brown, with a longitudinal three-toothed red stripe on the outer edge of each wing-cover.

"This is the most destructive borer of the elm in the Northern and Eastern States, often killing the trees by the wholesale. Great numbers of the larvæ of different sizes have been found boring in the inner bark and also furrowing with their irregular tracks the surface of the wood, the latter being, as it were, tattoed with sinuous grooves, and the tree completely girdled by them in some places. The elms on Boston Common have in former years been killed by this borer, and valuable trees, we have been informed, have been killed by them in Morristown, N. J. It has been found in all stages in the elm at Detroit, Mich., by Mr. H. G. Hubbard."

Dr. S. A. Forbes in the bulletin referred to gives an account of this insect associated with "a fatal affection of the elm now prevailing over a large part of southern Illinois."

SPRAY TEST FOR CONIFERS.

It seems often desirable to recommend sprays for coniferous trees infested by aphides and there is apparently not much data as to spray injury on such trees. For this reason Mr. William C. Woods applied the sprays here indicated upon young healthy conifers at Orono as follows:

(a) Whale oil soap. One pound in two gallons of water.

(b) 69-70 Bowker's Lime-sulphur (1 part of lime-sulphur to 40 parts of water). 1-70 Nikoteen (1 part of Nikoteen to 400 parts of water).

(c) Scalecide. (1 part Pratt's Scalecide to 25 parts of water.)

On August 25, 1911, Red Spruce, White Spruce, White Pine, Balsam Fir, and Larch were sprayed with (a) and (b). On September 5, 1911, the same species of trees were sprayed with (c).

About mid July, 1912, the sprayed trees were visited and careful comparison made between these and the nearest unsprayed checks.

	(a)	(b)	(c)
Larch	No injury	No injury	No injury
Red Spruce	(Trees not located).	(Trees not located).	No injury
White Spruce	No injury	No injury	No injury
White Pine	No injury	No injury	No injury
Balsam Fir	Slight injury. Tree had grown 2 ft.	A few leaves dead. No other injury.	Tree alive. 12 branches dead. 38 branches badly injured.

The experiment was not on a large enough scale to permit any sweeping generalizations, but the results certainly indicate no especial susceptibility on the part of these conifers to injury by sprays ordinarily used on other vegetation in combating scale insects and aphides. The sprays were heavily applied until the branches were dripping and a year later all the trees were in good condition except two of the Balsam Firs and as some unsprayed Balsam Firs in the vicinity selected for checks were also in an unthrifty condition the evidence that the state of these trees was due to the spray was not at all conclusive.

ENTOMOLOGICAL PAPERS FROM THE MAINE AGRICULTURAL EXPERIMENT STATION.

NOS. 41-59.*

41. *Insect Notes for 1909.* By O. A. Johannsen. Bulletin No. 177. Me Agr. Expt. Sta.
42. *The Fungus Gnats of North America.* Part II. By O. A. Johannsen. Bulletin No. 180. Me. Agr. Expt. Sta.
43. *Gall Aphides of the Elm.* By Edith M. Patch. Bulletin No. 181. Me. Agr. Expt. Sta.
44. *Four Rare Aphid Genera from Maine.* By Edith M. Patch. Bulletin No. 182. Me. Agr. Expt. Sta.
45. *Paedogenesis in Tanytarsus.* By O. A. Johannsen. Science, Vol. 32, p. 768.
46. *Insect Notes for 1910.* By O. A. Johannsen. Bulletin No. 187. Me. Agr. Expt. Sta.
47. *Macrosiphum destructor and Macrosiphum solanifolii.* By Edith M. Patch. Bulletin 190. Me. Agr. Expt. Sta.
48. *Insect Notes for 1911.* By O. A. Johannsen and Edith M. Patch. Bulletin No. 195. Me. Agr. Expt. Sta. 229-243.
49. *Pemphigus tessellata (acerifolii) on Alder and Maple.* By Edith M. Patch. Bulletin No. 195. Me. Agr. Expt. Sta., pp. 244-248.
50. *The Fungus Gnats of North America.* Part III. By O. A. Johannsen. Bulletin No. 196. Me. Agr. Expt. Sta.
51. *Notes on Psyllidae: Livia.* By Edith M. Patch. Psyche, Vol. 19, pp. 5-8.
52. *The Fungus Gnats of North America.* Part IV. (Conclusion) By O. A. Johannsen. Bulletin No. 200. Me. Agr. Expt. Sta.
53. *Aphid Pests of Maine.* Part I. By Edith M. Patch. Bulletin 202. Me. Agr. Expt. Sta., pp. 159-178.
54. *Food Plant Catalogue of the Aphidae of the World.* Part I. By Edith M. Patch. Bulletin No. 202. Me. Agr. Expt. Sta., pp. 179-214.
55. *Notes on Psyllidae.* By Edith M. Patch. Bulletin No. 202. Me. Agr. Expt. Sta., pp. 215-234.
56. *Elm Leaf Curl and Woolly Aphid of the Apple.* By Edith M. Patch. Science Vol. 36, pp. 30-31.
57. *A Tertiary Fungus Gnat.* By O. A. Johannsen. The American Journal of Science, Vol. 34, p. 140.
58. *Elm Leaf Curl and Woolly Apple Aphid.* By Edith M. Patch. Bulletin 203. Me. Agr. Expt. Sta.
59. *Woolly Aphid Migration from Elm to Mountain Ash.* By Edith M. Patch. Journal Economic Entomology, Vol. 5, p. 395.

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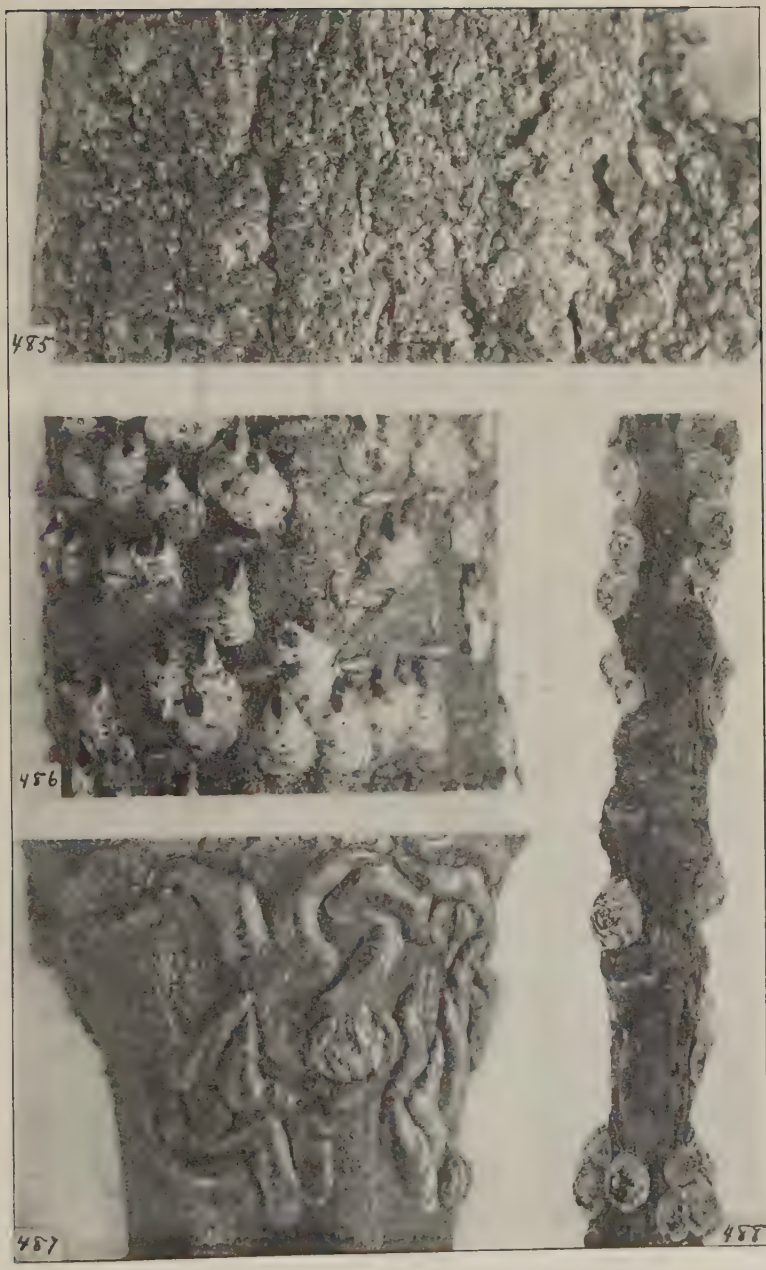
* For a detailed list of earlier publications see circular 382-5-10 of the Me. Agr. Expt. Sta.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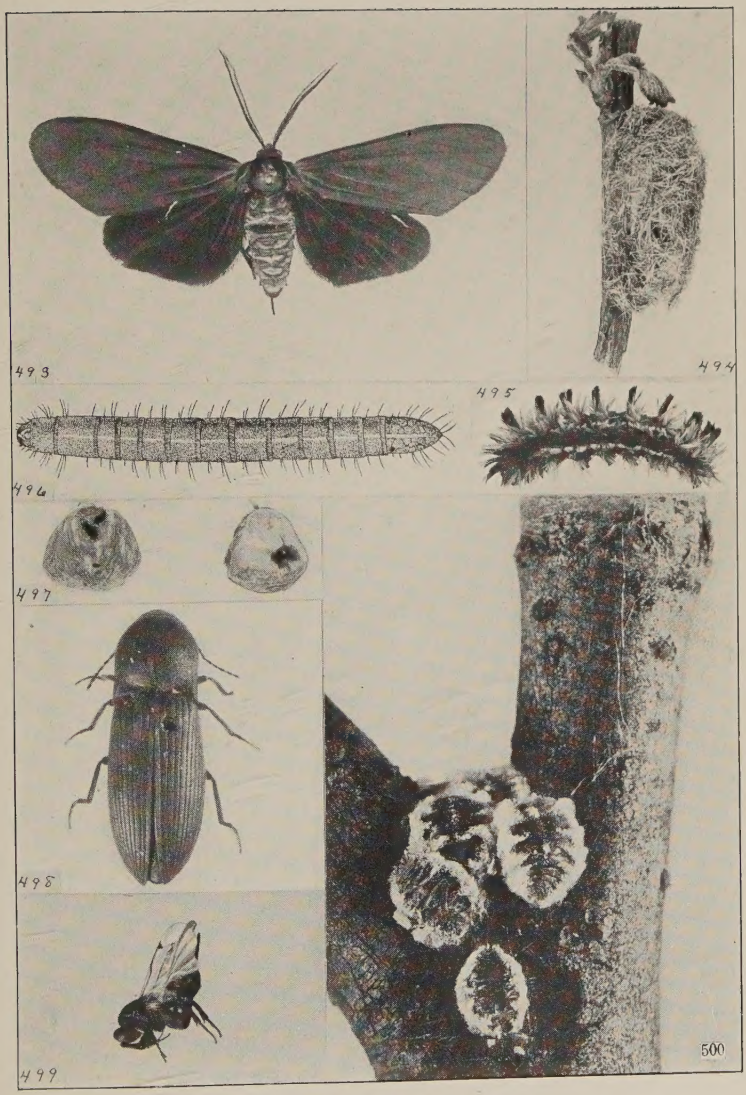
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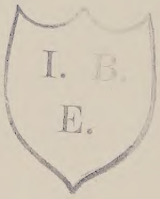
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